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GRAIN INSPECTION HANDBOOK  
BOOK 1  
General Information  
7-07-95

## CHAPTER 1

### GENERAL INFORMATION

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## 1.1 DEFINITIONS

Carrier. A truck, trailer, truck/trailer combination, railcar, barge, ship, or other container used to transport bulk, sacked, or packaged grain.

Certification. The process of issuing an official certificate that indicates the quality of a lot or sample of grain or the results of some other official service.

Composite sample. A single sample composed of small portions taken from throughout a lot.

Lot. An identified amount of grain offered by an applicant for inspection.

Lot inspection. The process of obtaining a representative sample(s) of an identified grain lot, examining or testing the sample(s), examining relevant records of the lot, and certifying the results.

Official personnel. Any authorized Department employee or person licensed by FGIS to perform all or specified functions under the Act.

Official sample. A representative sample drawn by official personnel licensed or authorized by FGIS.

Sampling. The process of drawing a representative sample from a lot of grain.

Security container. A locked container in which official personnel store grain samples, supplies, and equipment.

Stowage examination. The process of visually determining if an identified carrier or container is clean; dry; free of live infestation, rodents, unknown substances, and foreign odor; suitable to store or carry grain; and certifying the results.

Submitted sample inspection. The process of grading or testing a sample of grain (other than an official sample) submitted by an applicant and certifying the results.

## 1.2 ABBREVIATIONS

The following abbreviations may be shown on work records.

ANFL	Animal Filth	DLQ	Distinctly Low Quality	SOUR	Sour
MOTHS	Angoumois Moths	GAR	Garlicky	SR	See Reverse
BRDX	Bird Excreta	HTG	Heating	SMUT	Smutty
BNS	Bottom Not Sampled	INF	Infested	FSUB	Unknown Foreign Substance
GLAS	Broken Glass	MUST	Musty		
CBUR	Cocklebur	RODX	Rodent Excreta		
COFO	Commercially Objectionable Foreign Odor				

## 1.3 SAFETY<sup>1</sup>

- a. General. Comply with FGIS Directives 370.3, 370.4, and 370.5, and all pertinent Occupational Safety and Health Administration (OSHA) requirements; i.e., 29 CFR 1910 - 1918.
  - (1) Obey all posted warning signs and wear appropriate protective equipment when conditions warrant; e.g., ear protection when the noise level is high.
  - (2) When practical, carry a two-way radio for communication and use it in emergency situations.
- b. Life Vests. Wear a fastened, Stearns life vest, model IWV-222-1 (if not available, any U.S. Coast Guard-approved Type I, II, III, or V PFD life vests may be worn), when aboard barges or other vessels (midstream or dockside).

**NOTE: Life vests must be international orange in color and contain retro- reflective panels. If used at night, the vest must be equipped with a light and whistle.**

- c. Clothing.
  - (1) Hard hats must be worn that meet the American National Standards Institute (ANSI) Z89.1 or Z89.2 criteria.

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<sup>1</sup> The safety requirements referenced in this section are mandatory for FGIS employees. Official agency employees are strongly encouraged to also follow them, as well as all OSHA regulations.

- (2) It is recommended that official personnel wear shoes or boots that have nonslip soles and definite heels for good footing on ladders.
- (3) Wear clothes that are reasonably close-fitting to reduce the possibility of becoming snagged on moving belts, ladders, or other equipment found in and around elevators and on carriers.
- (4) Gloves should be worn when climbing ladders and opening or closing hatches and doors.

d. Gangways and Ladders.

- (1) Check gangways before boarding. Do not use defective gangways.
- (2) Exercise extreme care when using ladders that are permanently affixed to carriers. Such ladders can become bent, broken, twisted, corroded, or have missing rungs. Do not use defective ladders.
- (3) Do not hand-carry sampling equipment, radios, or other equipment while climbing ladders.

e. Chemical Treatments. Remain alert to your physical condition, especially when drawing samples inside carriers. Grain is often treated with chemicals, usually for the purpose of controlling insect infestation. Contact with toxic fumes or sprays from these chemicals can cause serious injury or death. Shortness of breath, a headache, light-headedness, or drowsiness can be indicative of a dangerous atmosphere. When these symptoms are experienced, immediately leave the area and seek medical attention.

f. Transportation.

- (1) Travel to and from barges and ships anchored in midstream by a U.S. Coast Guard-approved launch, tugboat, or water taxi, or by an FAA-approved helicopter or air taxi.
- (2) Do not jump on or off a barge or ship. You must be able to step easily from the launch to the vessel without stretching or straining over water. Expect slippery or obstructed deck conditions when boarding a barge or ship.

g. Dock Areas.

- (1) Be alert for loose or rotting boards that may not support your weight when walking on a dock or wharf.
- (2) Learn the locations of life rings, emergency ladders, and telephones. Stay clear of all cables whether slack or under tension.
- (3) Watch out for tow-motors, cranes, cables, and debris.

h. Barges and Ships.

- (1) Do not probe sample barges at night unless the barge is docked and there is sufficient artificial light.
- (2) Use caution when walking on ship decks, barge tops, and ship gangways since they are uneven, slippery when wet, and have protruding cleats and latches. Stay clear of mooring ropes when they are being adjusted.
- (3) Do not remain on barges while they are being moved. Be aware of nearby barges, docks, or vessels which could collide with the vessel you are working on. Even a gentle bump can cause covers to roll.
- (4) Require the applicant to roll back the hatches and rolltop covers, and lock them in place with lock pins. Do not permit hatches to be opened or closed while you are inside the barge or ship.
- (5) Do not sample barges alone unless you are being monitored by someone who is in a position to render aid if needed. (That person may be an elevator employee or tugboat crew member.)

i. Railcars.

- (1) Before entering a railyard, notify your immediate supervisor, the yardmaster or switch-crew foreman, and any other essential persons of your presence. Also, inquire about possible switching activities, cars carrying hazardous cargo, and any other unusual activity. Do not sample railcars alone unless you are being monitored by someone who is in a position to render aid if needed. (That person may be an elevator employee.)
- (2) Before beginning sampling, see that all activity ceases on the track where you will be working:

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- (a) Require the track to be locked-out, or
  - (b) Require derails to be installed at both ends of the string of cars, or
  - (c) Follow other appropriate, locally-approved precautions; e.g., using blue flags with radio communication between official personnel and switch engine operator, using one or more additional employees as safety observers to warn-off approaching railcars, or using blue flags and a lock-out switch on an elevator hold-track where no railcar or switch engine movement takes place during the performance of official functions.
- (3) Do not probe sample railcars at night unless adequate artificial light is provided.
  - (4) Do not walk on rails. Always walk outside of tracks, never between.
  - (5) Ensure that no power lines are close enough to present an electrical hazard (minimum safe distance from power lines is 25 feet in all directions).
  - (6) Check for placarded railcars. If a railcar is not placarded but a fumigant odor is detected, withhold sampling (don't enter the car) and notify your supervisor immediately.
  - (7) Never crawl under, through, or over railcar couplings.
  - (8) Never walk through a break in a string of railcars separated by only a few feet (minimum safe distance - 20 feet).
  - (9) Always be alert to such hazards as moving railcars, cables, debris, metal strapping, and broken ladders.
  - (10) Be alert to seasonal conditions, such as icy or muddy walking surfaces, standing water, snow, and rain in the colder months; and rodents, snakes, insects, and other animals in the warmer months.

- (11) Always exercise caution when opening or closing hatches or doors. If a hatch or door is stuck open or closed, request assistance from the applicant.
- (12) If at all possible, do not use your hands to break seals. Use a cutting tool or pry bar.
- (13) Do not ride on a switch engine or a moving railcar. If inside a railcar and it starts to move, assume a sitting or kneeling position on top of or in the car to avoid losing your balance and hold on. Do not attempt to descend the ladder or jump to the ground until the car has stopped and you can do so safely. Report all such incidents to the yardmaster and your supervisor.
- (14) Before leaving the railyard, notify the yardmaster or switch-crew foreman, and any other essential persons that you are leaving the work area.
- (15) Report "bad order cars" (e.g., missing ladder rungs and broken doors) to the car owner, the railyard superintendent, or the applicant for inspection.

j. Trucks.

- (1) Do not walk through a break in a string of trucks separated by only a few feet.
- (2) Be alert to such hazards as moving trucks, cables, debris, metal strapping, or broken ladders.
- (3) Avoid breathing diesel exhaust fumes.

k. D/T Sampler Sites.

- (1) Watch out for dangerous accumulations of dust and grain spills.
- (2) Be familiar with elevator evacuation plans and follow the recommendation of the elevator manager if an evacuation is required.

## 1.4 REPRESENTATIVE SAMPLE

Obtaining a representative sample from a lot of grain is an important and essential part of the grain inspection process. If the sample is not representative, the inspector's final grade will not reflect the true grade of the lot. For a sample to be considered representative it must be:

- a. **Obtained by official personnel using official procedures and FGIS-approved equipment.**
  - (1) Official personnel include licensed samplers, technicians, and inspectors employed by official agencies and FGIS employees authorized to sample grain.
  - (2) Official procedures include FGIS directives, handbooks, and policy bulletins (e.g., Book I, Grain Sampling); and local FGIS field office/official agency policy memorandums
  - (3) See the FGIS Equipment Handbook for a complete list of approved equipment. Representative samples may be drawn from trucklots, carlots, and domestic movement bargelots by probe, pelican, Ellis cup, or diverter-type mechanical sampler. Except in an emergency, export shiplots and bargelots must be sampled by diverter-type mechanical sampler.
- b. **Of the prescribed size**--approximately 2,500 grams, but not less than 2,000 grams in size.
- c. **Handled securely, protected from manipulation, substitution, and careless handling.** Samples shall never be out of the sampler's control and/or observation and may lose their representativeness by being:
  - ⊗ Thrown or dropped from a railcar or other carrier;
  - ⊗ Spilled, no matter how little is lost or how much is recovered;
  - ⊗ Left unattended during the collection process;

- ⊗ Stored in an improper manner or in an area not under the control of official personnel. Store samples that are not graded on the same day they are obtained in approved, moisture-proof containers to prevent any change in condition; or
- ⊗ Transported by means which do not ensure the integrity of the sample. Official samples may be shipped via public transportation (e.g., commercial bus or air freight) **provided that** all necessary security precautions are taken, including--but not limited to-- enclosing the sample bag in a lock box or mail bag secured by a metal seal or lock.

## 1.5 DETAILED WORK RECORD

The accurate recording of the lot's identity and condition at the time of sampling is vital to the correct certification of the lot's quality. It is not unusual for a grade-determining condition, such as large stones, heating grain, or moths, to be readily apparent in the lot during sampling but not in the sample. Also, insects, debris, and unknown foreign substances may be found around hatch openings and under walkways of carriers. When such conditions are found, clearly note the condition--in detail--on the sample ticket or comparable work record. Sample tickets shall contain the following information:

- ✍ Sampler's signature or initials.
- ✍ Date the sample was obtained.
- ✍ Location of the lot at the time of sampling, e.g., IC Yard. If the city and/or State are not obvious, this must also be shown.
- ✍ Identification of the lot, including:
  - ◇ For trucklots, the truck's license plate number, with State abbreviation;

**NOTE: Sometimes, a truck may return to an elevator more than once a day. To keep the trucklots separate, show additional identifiers, such as a contract numbers or the time each sample was taken.**

- ◇ For truck-trailerlots, the trailer's license plate number (not the tractor's), with State abbreviation;

**NOTE: Trucklots, truck-trailerlots, and similar lots may be identified by other identifiers provided the applicant agrees with the identifier used and the identifier permits clear identification of the lot.**

- ◇ For railcar lots, the alphanumeric on the side of the car (make sure that the same identifier is shown on all sides of the car);
- ◇ For bargelots, the complete name and/or alphanumeric as shown on the barge; and
- ◇ For shiplots, the name of the vessel preceded by the abbreviation for it's means of propulsion; e.g., MV.



Type of carrier; e.g., truck, hopper car, or barge.



Type of movement; e.g., in, out, local, or export.



When applicable, the number and prefix of seals broken and applied.



Method of sampling.



When applicable, any information related to the condition of the carrier's stowage area.



Other pertinent information that may affect the grading or certification of the lot, such as the notation "Top \_\_\_\_ feet sampled. Bottom not sampled."

## 1.6 ACCESSIBILITY

To obtain a representative sample, the entire lot must be completely and safely accessible.

- a. Hazardous Conditions. When hazardous conditions exist which could endanger the health of the sampler, consider the lot inaccessible and dismiss the inspection request. Hazardous conditions include, but are not limited to:
  - The presence of insecticides, fumigants, or other chemical odors;
  - Uncontrolled railyard switching;
  - Electrical storms;
  - Ice on top of barges, railcars, and ships;
  - Broken or unsecured ladders; and
  - Low hanging electrical wires.
- b. Heavily Loaded. If a container is loaded in such a manner as to prevent drawing a sample according to established procedures, consider it to be "heavily loaded."
  - (1) Dismiss requests for sampling and inspection of "heavily loaded" out-bound movements of grain.
  - (2) "Heavily loaded" in-bound and local-movements of grain shall be sampled as accurately as possible, and the statement "Partial Inspection - Heavily Loaded" shown on the sample ticket with a description of the sampling method and location from which the samples were drawn.
- c. Entrances.
  - (1) Trucks. Consider grain in trucks to be inaccessible for sampling when tarps, coverings, or doors are not fully removed or opened.
  - (2) Other Carriers. Consider grain in other carriers to be inaccessible for sampling when hatches or doors cannot be opened.

## 1.7 SAMPLE INTEGRITY

- a. Often, when grain is sampled online by either mechanical or manual sampling devices, there is a break in the loading/unloading process and official personnel are dismissed. In such situations, if adequate security measures are not taken, grain could be loaded on top of the lot or removed from the lot during the sampler's absence. As a result, the sample would not be representative of the grain in the carrier and a false or incorrect certificate might be issued.
- b. Whenever there is a break in online sampling activities, take **all** necessary actions to ensure that no grain can be loaded into or unloaded from the carrier until you return to the work site and sampling activities resume.

**NOTE: Official agency and/or FGIS field office managers are responsible for determining what precautions are needed at each facility.**

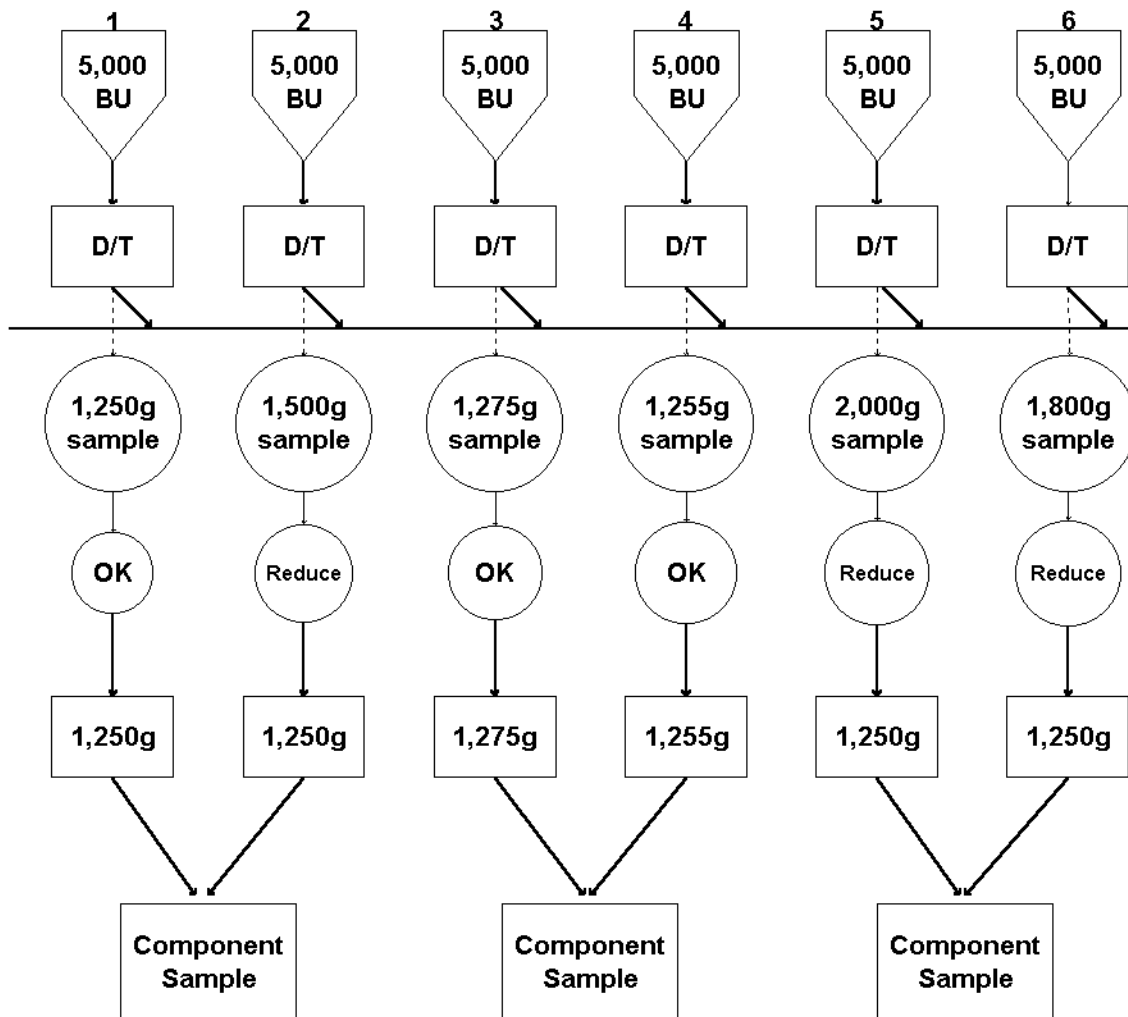
- c. Note on the sample ticket, or another comparable work record, what and when such precautions are taken. Appropriate precautions may include, but are not limited to:
  - ✓ Locking-out belt trippers and other elevator grain handling equipment.
  - ✓ Applying seals(s) to the carrier to deter and detect any carrier-related grain handling activity.
  - ✓ Physically monitoring the elevator and carrier.
  - ✓ Preparing notes and diagrams regarding the position of grain within the carrier, draft level, or other pertinent information to assist in determining if grain was added or removed.

**NOTE: If you suspect that grain was loaded into or unloaded from a carrier during a break in sampling operations, notify your supervisor immediately in accordance with FGIS Program Directive 366.1, "Reporting Violations of the U.S. Grain Standards Act and the Agricultural Marketing Act of 1946," and FGIS Program Directive 907.5, "Deceptive Grain Handling Practices."**

## 1.8 PROPORTIONAL SAMPLING

- a. Frequently, a sample drawn from one carrier or portion of a carrier is combined with another sample(s) to form a component, subplot, or combined-lot sample. Prior to combining such samples, the sampler must ensure that the samples are proportional; i.e., samples of like size represent like amounts of grain.
- b. There are two common problem situations:
  - (1) **When grain is being loaded into a barge or ship**, the amount of sample that's obtained by an online sampling device (i.e., D/T) can vary from sample to sample depending on the elevator's load-out rate. As the load-out rate increases, the amount of sample obtained usually decreases. Consequently, one subsample may weigh 3,000 grams, while another subsample that represents the same amount may weigh only 2,000 grams.
  - (2) **When two or more separate trucklots, carlots, or lash bargelots are offered for inspection as a combined-lot**, the volume of grain in each of the carriers can range widely. But often-particularly if the lots are probe sampled--the individual lot samples will all be about the same size, regardless of the actual amount of grain in the individual lots. That is, a sample drawn from a 200,000-pound railcar lot will weigh the same as a sample drawn from a 150,000-pound railcar lot.
- c. Unless you are aware of such situations and take necessary precautions, a significant portion of a lot could be over- or under-represented. Before combining samples:
  - (1) Establish an acceptable sampling ratio (e.g., for each 5,000 bushels of grain there will be exactly 1,250 grams of sample). This ratio should be based on the minimum amount of sample that can be expected to be obtained from any single subsample or lot sample.
  - (2) Weigh (or visually-determine) the size of each sample before combining.
  - (3) If a sample weighs more than it should for the amount of grain it represents, reduce the sample so that it conforms to the established sampling ratio.

FOR EXAMPLE: If a D/T normally delivers 1,250 grams of sample for each (approximate 5,000 bushels of grain sampled, then *all* samples drawn from the lot must conform to the 1,250 grams-to-5,000 bushel ratio. Samples that are not reasonably proportional must be adjusted before being combined with other samples (“reasonably proportional” means the standard sample size  $\pm 5\%$ ). The diagram below illustrates this example.



## 1.9 UNUSUAL CONDITIONS

- a. Do not allow yourself to be hurried to the point that the integrity of the sample is undermined or a condition, such as objectionable odor, insect infestation, or heating, is overlooked. Remember, obtaining a representative sample is the most important aspect of a sampler's job.
- b. If you suspect that the quality of the grain in the sample is not indicative of the true quality of the grain in the lot or that the carrier might be deceptively loaded (see FGIS Program Directive 907.5 for examples of deceptive practices), draw another representative sample using a slightly different sampling pattern or a longer probe, or draw an auxiliary sample.

**NOTE: If deceptive loading is suspected, notify your supervisor as soon as possible.**

- c. An auxiliary sample is drawn only for the purpose of determining if the lot's true condition is indicated by the representative sample.
  - (1) An auxiliary sample is used to "backup" the representative sample, not as another representative sample. For example, if you suspect that a hopper car containing grain is contaminated with fertilizer--even though no fertilizer was present in the probe sample--draw an auxiliary sample.
  - (2) Auxiliary samples may be obtained in any safe manner that is effective in obtaining a sample from the portion of the lot that is suspected of being contaminated or of being a distinctly different quality than the remainder of the lot; e.g., in a hopper car, an unusually long probe may be used or a well may be dug so that the bottom of the carrier can be reached.
    - (a) If an unusual condition is found in an auxiliary sample, identify the auxiliary sample with a separate sample ticket and submit the auxiliary sample along with the representative sample.
    - (b) The identification should indicate the specific location in the lot where the auxiliary sample was drawn. For example: "Auxiliary Sample, Compartment B-1, N&W 176186."

**NOTE: Do not mix the auxiliary sample with the representative sample.**

- d. If you observe any of the following conditions in a lot, a representative sample, or an auxiliary sample, report the condition on the sample ticket.
- (1) Angoumois Moths. If moths are found flying or crawling around the lot or the carrier, record an estimate of the number observed.
  - (2) Infestation. If weevils, grain borers, insect larvae, bran bugs, or other insects injurious to stored grain are found on, around, or about the lot, note the number, type, and location where observed.

**NOTE: To aid in insect identification, refer to FGIS Interpretive Line Slides IN-1.0 through IN-30.0, "Insects Commonly Found in Grain." See Book II, Chapter 1, for more information.**

- (3) Large Debris and Other Sample Grade Factors. If any of the following conditions are observed in a lot, record the amount, size, number (whichever is more applicable) and the location where found:
  - Large stones, large sticks, cobs, cement;
  - Pieces of metal, glass, or fertilizer;
  - Rodent or bird excreta;
  - Castor beans, crotalaria seeds, or cocklebur;
  - Lumps of grain, unknown foreign substance, toxic material, or unnatural odors (see Figure 1. "Odor Classification Chart"); and
  - Material too large to enter a probe.
- (4) (Heating Grain. When high temperatures develop in grain as the result of excessive respiration, such grain is called "heating." Heating grain usually gives off a sour or musty odor.
  - (a) Note the location and quantity on the sample ticket.

- (b) Do not confuse heating grain with grain that is warm due to storage in bins, cars, or other receptacles during warm weather.
- (5) Distinct Differences in Quality or Other Unusual Conditions.  
Describe the condition in detail on the sample ticket.
- (6) Odors. Odors should be detected on the original sample at the time of sampling.
  - (a) In railyards and other locations where an inspector is not accessible, immediately place the suspect sample into an airtight container for transport to the laboratory for a examination by an inspector.
  - (b) Musty and sour odors are the result of mold growth or of fermentation and heating. These odors are indexes of deterioration in grain quality that materially lowers the grain's value to end users.
  - (c) Commercially objectionable foreign odors are the result of absorption by grain of residual odors from hides, oil, and other material. See Figure 1. "Odor Classification Chart" for a list of these and other odors that may be found in grain.

Sour	Musty	Commercially Objectionable Foreign Odors
Boot (bottom of leg) Pig pen Permenting Grain Insect Odor Heating Grain	Moldy Earth Ground Insect Odor Heating Grain	Animal hides Decaying Animal and Vegetable Matter Fertilizer Skunk Oil Products Smoke Weed Seed
<b>CAUTION: DO NOT PLACE YOUR FACE OR NOSE IN GRAIN THAT HAS RECENTLY BEEN TREATED FOR THE PURPOSE OF DESTROYING INSECTS!</b>		

Figure 1. Odor Classification Chart